CHAPTER I

INTRODUCTION

One of the most important problems in the atmosphere is high levels of CO_2 gas which comes from many different sources, e.g. by industrial activities and gasification processes. Therefore, it is very important to design adsorbent materials that would adsorb CO_2 gas before being liberated into the environment.

Polymerization of the monomeric continuous phase of a high internal phase emulsion(HIPE) gave highly porous crosslinked polymer materials. The monomer system which received the most attention in PolyHIPE studies is styrene/divinylbenzene (DVB). A lot of effort was invested to determine the factors which affect the cellular structure and cell size of the resulting porous polymers, and in 1997, Neil R. C. *et al.* have described the production of PolyHIPE materials with high internal surface areas, employing methodologies similar to those used in porous polymer bead preparation. Scanning electron micrograph of the material (SEM) can clearly see the foamlike morphology of open-cellular Poly-HIPE materials (Figure 1).

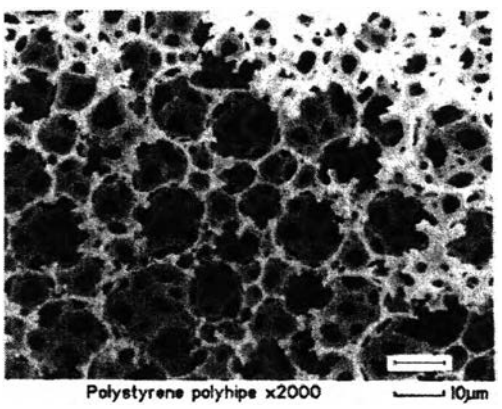

Figure 1 Scanning electron micrograph (SEM) of poly-(styrene/DVB) PolyHIPE

The open-cell polymers are characterized by an extremely low dry bulk density, less than 0.1 g cm^{-3}, which is due to complete interconnection between all

neighboring cells. Their mechanical properties are similar to gas-blown polystyrene foams, although the smaller cell sizes and higher degree of cellular spherical symmetry of the emulsion-derived foams produces higher compressive strengths. However the inherent brittleness of polystyrene and the characteristic low density of PolyHIPE polymers, monolithic materials derived from styrene/DVB tend to fragment into particles rather easily under mechanical stress. Moreover, they possess low thermooxidative stability and low selective property. This could be rectified by the addition of a high-performance polymer such as polysulfone to get good mechanical properties and good selectivity.

In this work highly porous polymeric foam of poly(DVB) filled with maleimide-terminated poly(arylene ether sulfone)oligomers via high internal phase emulsion for selective retention of carbondioxide gases were prepared. The obtained materials were characterized using SEM and the CO_2 adsorption ability was measured using GC.